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The ELM LEAF BEETLE



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THE ELM LEAF BEETLE

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The elm leaf beetle (*Galerucella xanthomelaena* (Schr.)) is an insect of European origin, but it has been in the United States for at least a hundred years. It is said to have seriously injured elm trees in Baltimore, Md., as early as 1838. How, when, or where it was introduced is not known. At present the beetle occurs from Maine to North Carolina, westward to Michigan, Indiana, Kentucky, and Tennessee, and in California, Oregon, Washington, and Idaho.

Its Injury

The elm leaf beetle feeds on the leaves of elm, and when it is abundant the leaves become brown and fall off (fig. 1). Under such conditions new leaves often appear over at least a portion of the tree,



FIGURE 1.—Elm trees defoliated by the elm leaf beetle; trees other than elm with normal foliage.

and these are also fed upon. Such defoliation weakens the trees, and many valuable elms have been killed as a result of outbreaks of this insect.

The elm leaf beetle never causes noticeable injury to woodland elms. Only trees growing in cities, towns, or villages, or near buildings are severely attacked. All species of elm found in this country are fed upon, although some observers have stated that the beetle prefers the English elm.

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Description of Different Stages and Habits

The parent beetle is about one-fourth inch long. When it first emerges from the pupal case it is light yellow, with an olive-green stripe along the outer margin of each wing cover (fig. 2, *b*). It soon becomes darker and duller, and the older beetles are dull olive green with the stripes rather indistinct. The insect passes the winter in the beetle or adult stage, hibernating in places where it can find suitable protection, on or near the tree on which it fed. In the Northeastern States, at least, by far the greater number of beetles hibernate in buildings, especially in house attics, barns, and sheds. They emerge on warm spring days and fly to nearby elms, where they eat holes in the developing leaves (fig. 2, *a*). Later they mate, and the females lay their small, yellow, spindle-shaped eggs in small, compact clusters of two or three rows each. The eggs are attached endwise to the undersides of the leaves (fig. 2, *c*).

The eggs hatch in about a week, and the larvae, or grubs, feed on the under surfaces of the leaves (cover illustration and fig. 2, *a*), leaving the veins and upper surfaces intact. This skeletonizing results in portions or all of the leaf becoming semitransparent and later drying and turning brown. The newly hatched grubs appear nearly black because the yellow color of the skin is obscured by dark tubercles and prominent hairs (fig. 2, *d*). As they increase in size the grubs shed their skins, and the yellow color becomes more prominent. In 2 or 3 weeks they become full-grown and are about one-half inch long (fig. 2, *e*). They are then dull yellow, with a black stripe running lengthwise along each side of the body.

Before transforming to the bright orange-colored pupae (fig. 2, *g*), the mature grubs may drop to the ground, crawl down the trunks of the trees, or seek places for pupation on the trees. These pupae are found under grass, leaves, or other material on the surface of the ground, especially near the bases of the trunks, or behind flakes of bark on the tree. Within the pupal case the insect gradually changes to the adult beetle, which emerges from the case about a week after the pupa was formed.

The beetles that issue from hibernation in the spring continue laying eggs for a considerable period, so before the parent females die beetles may develop from the first eggs laid. Some of the females that emerge from the pupal cases during the summer lay eggs from which beetles later develop. The extent to which this occurs depends on climatic conditions. Many beetles that mature during the summer months seek hibernation quarters rather early in the season, but this movement continues until cool weather. Places near or on the trees on which the beetles have fed are selected for hibernation.

Natural Checks to Increase of Beetles

Toads, birds, and several species of insects have been reported as feeding on the elm leaf beetle. Attempts have been made to establish in the United States certain insects that reduce its numbers in Europe, but so far as known these efforts have not been successful. A white mold or fungus (*Sporotrichum globuliferum* Speg.) is considered by some to be perhaps the most important enemy of the pest in the United States. It kills pupae and adults late in the summer, especially during moist seasons.

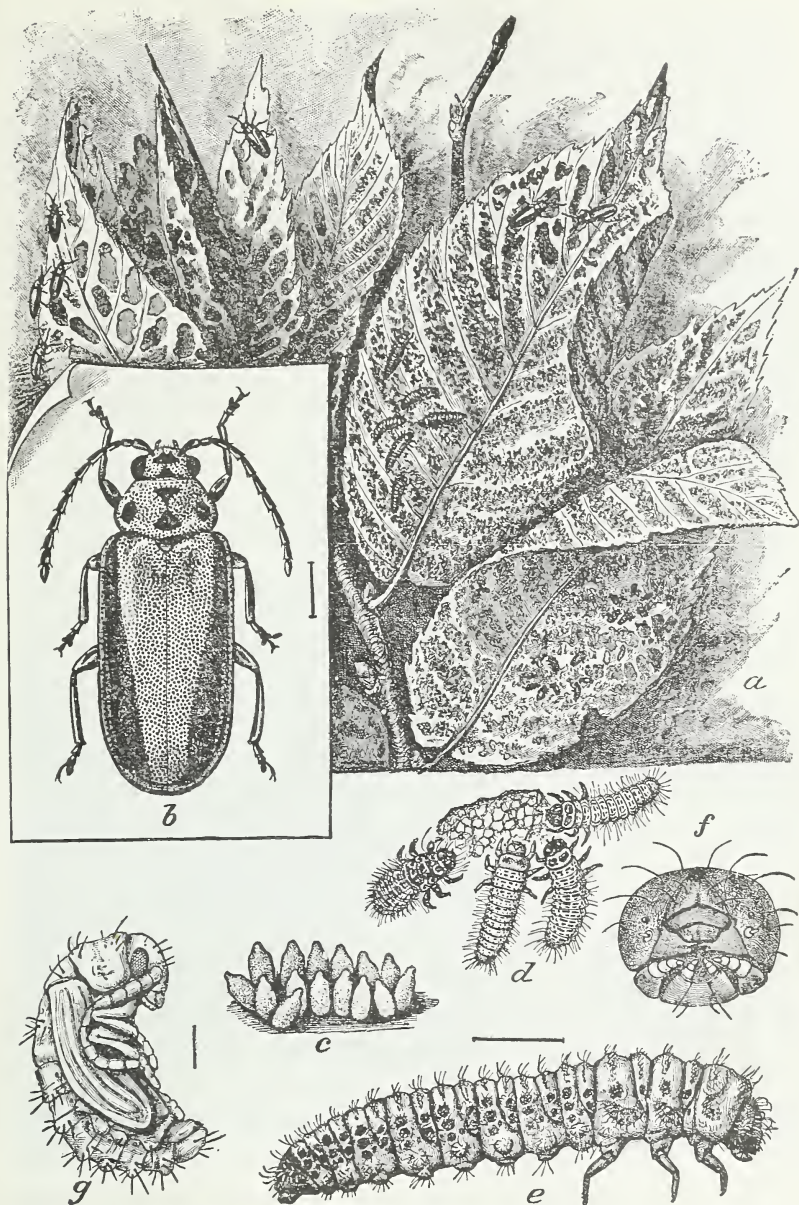


FIGURE 2.—The elm leaf beetle: *a*, Elm leaves showing the feeding work of adults and larvae (slightly reduced); *b*, adult beetle; *c*, eggs; *d*, young larvae; *e*, full-grown larva; *f*, mouth parts of mature larva; *g*, pupa; (*b*, *c*, *d*, *e*, *f*, and *g* all greatly enlarged).

Controlling the Insect

Spraying with an Arsenical Poison

The best known method of avoiding injury by the elm leaf beetle is to spray the foliage of the trees with a mixture containing an arsenical poison. For most property owners, the spraying of shade trees is difficult and expensive. This is often particularly true of elms because of their height. Costly equipment and experience on the part of persons using it are necessary to spray such trees properly (fig. 3). Furthermore, in the case of small properties the effort made by an individual to protect his trees from the pest is often partly nullified because owners of adjoining properties make no such effort. In the case of large private properties and publicly owned parks and playgrounds, it is obvious that this does not hold true. It does hold true, however, where elms along streets are sprayed while those on adjoining properties are neglected.

Satisfactory control of the elm leaf beetle is usually a community problem. The ideal method of procedure in such cases would be to have someone with the necessary training and experience determine what trees should be sprayed and then to have these trees properly treated at public or private expense, or both. In the Northeastern States it has been found that a survey should be begun late in the summer to determine what trees should be sprayed the following year. Observations have shown that often only a few trees or those in a limited area need to be sprayed, and where adequate spraying is not done the same trees are attacked from year to year. Such trees are usually near buildings in which large numbers of beetles spend the winter. During the latter part of the summer and in the fall the beetles leave the trees to hibernate in nearby buildings, and in the spring they go back to the same and neighboring trees.

One proper application of a suitable arsenical spray mixture early in the season will protect elm foliage from the elm leaf beetle throughout the season. Not only will it kill those adults and small grubs that are feeding on the leaves at the time of application, but a sufficient quantity of spray will remain to prevent noticeable injury by beetles and grubs that may attack the foliage later. To obtain this result a substance known as a "sticker" is used. Fish oil or linseed oil is recommended for this purpose. Fish oil has an odor that is objectionable to most persons, though it disappears a few hours after the spray is applied. The formula for the mixture is as follows:

Lead arsenate.....	4 pounds.
Fish oil or linseed oil.....	16 ounces (1 pint).
Water.....	100 gallons.

The proper time to spray is just after the beetles have left hibernation and before many eggs have hatched. This period will naturally vary for different sections of the country. In the northeastern section it falls late in May or early in June. Care should be taken not only to reach all leaves with the spray but especially their undersides, since it is there that the grubs feed.

The best time to spray is right after daybreak. The air is usually calm at that time, and the drifting of droplets to buildings can best be avoided under such conditions. An additional reason for spraying



FIGURE 3.—Tall trees being sprayed with a high-powered spraying outfit.

street trees immediately after daybreak is because automobile traffic is then usually at a low ebb.

If liquid spray mixtures come in contact with buildings and are allowed to dry, they render them more or less unsightly. Where a sticker such as fish oil or linseed oil is used the residue adheres for a much longer time than when a sticker is not used. Spray mixtures containing these oils can be readily washed from the surfaces of buildings if the latter are drenched with water before the spraying is begun

and again sprayed with water from a garden hose after spraying with the mixture is finished and before the surfaces dry.

Spraying with Contact Insecticides

As the grubs often transform to pupae on and about the bases of trees and as they are found there in large numbers during severe outbreaks, it has been a common practice to recommend the use of various contact insecticides under such conditions. It is intended that these liquids shall be sprayed on the grubs, pupae, and newly developed beetles to kill them. The formulas for two mixtures recommended for this purpose in recent years are as follows:

FORMULA 1

	<i>Small quantities</i>	<i>Large quantities</i>
Summer-oil emulsion.....	1 pint.	2 gallons.
Nicotine sulphate.....	{ 2 ounces or 12 teaspoon- fuls.	1 quart.
Water.....	6¼ gallons.	100 gallons.

FORMULA 2

	<i>Small quantities</i>	<i>Large quantities</i>
Nicotine sulphate.....	2 teaspoonfuls.	1 quart.
Laundry soap or soap flakes, dissolved.....	{ 1 inch cube or 3 tablespoonfuls.	4 pounds.
Water.....	1 gallon.	100 gallons.

Although spraying the insects on and about the bases of the trees with such insecticidal mixtures kills many of them, such treatment cannot be expected to take the place of proper spraying of the foliage with an arsenical poison. The greater part of the damage that the insect can cause during the season has already been done, and, furthermore, many of the grubs transform to pupae elsewhere. Pupae occur behind bark in the upper parts of the trees and on the surface of all soil beneath their crowns.

Trapping the Beetles

When it is known that adults of the elm leaf beetle are hibernating in large numbers in such places as attics and lofts, it is sometimes possible and worth while to trap them as they are leaving their winter quarters in the spring. Over 4,000 were thus trapped in a house attic and over 20,000 in a barn loft during 1 year. Most of the openings that admitted light were covered with black paper. Wooden frames on which cellophane was stretched tightly were placed over the windows not covered with black paper. The inner surface of the cellophane was coated with a sticky proprietary preparation used for banding trunks of trees to prevent insects from ascending them. As the beetles came out of hibernation they were attracted to the light admitted through the cellophane and were caught and held in the sticky material.

Where beetles are seen congregating in the spring on and around the inner surfaces of windows, they can be stunned or killed with any common household fly spray, swept up, and burned.

